

The first plot below shows the intensity of light from a star during seven days, dimmed by a planet crossing in front. The star has a radius of 2×10^9 meters.

- What is the orbital period of the planet (in days)?
- What is the radius of the planet (in meters)? Show your work.
- At your telescope with a spectrometer, you take a spectrum of the star every minute during those same 7 days, allowing you to measure the wavelength (λ) of a spectral line from hydrogen in the star. Sketch a plot of the Doppler shift, $\Delta\lambda$, during those same 7 days. Use the plot axes provided to make your sketch.
- Assume the star has a mass equal to that of the Sun. Calculate the orbital radius of the planet and from that determine the speed, v , of the planet in its orbit. (Assume a circular orbit.)
- Estimate the duration of the transit, Δt directly from the plot of intensity vs time. Now use the speed of the planet, v , from part d) to determine the length of the path (“chord”) of the planet across the disk of the star (in meters). (This path is not necessarily straight across the equator).

